

MANITOBA DEPARTMENT OF AGRICULTURE AND IMMIGRATION
WINNIPEG, MANITOBA

Rations for Animals and Poultry in Manitoba

Recommendations of the Manitoba Feed Board



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AVERAGE PERCENT ANALYSIS OF FEEDS

Feeding Stuff	Crude Protein		Crude Fat	Crude Fibre	Total Dig. Nutrients (Appr.)	Calcium	Phosphorus
	Total	Digestible					
Barley.....	12.5	11.0	2.4	6.2	78.3	0.05	0.38
Buckwheat.....	11.9	8.9	2.4	10.3	64.4	0.04	0.29
Corn.....	9.7	7.4	4.0	2.3	83.7	0.01	0.28
Molasses (cane).....	3.0	1.0			59.2	0.56	0.06
Oats.....	12.4	9.7	4.8	11.0	67.8	0.09	0.33
Oat Groats.....	14.3	11.4	8.1	1.4	86.0	0.09	0.44
Wheat.....	14.6	10.8	2.1	4.1	83.6	0.03	0.43
Alfalfa Meal.....	15.2	10.8	1.9	28.4	53.9	1.31	0.17
Alfalfa Leaf Meal.....	21.9	16.9	3.0	18.0	57.0	1.90	0.22
Brewers' Grains (Dried).....	24.0	18.0	7.0	15.0	60.0	0.25	0.47
Wheat Bran.....	16.4	12.5	5.7	10.7	61.0	0.12	1.32
Wheat Middlings.....	17.4	12.9	4.9	4.5	73.3	0.10	0.88
Wheat Shorts.....	17.0	12.4	5.2	7.1	70.3	0.08	0.94
Buttermilk Powder.....	33.8	32.1	5.6		85.5	1.36	0.74
Distillers' Grains { Corn Wheat Rye	29.0		10.0	14.0		0.04	0.29
	25.0		7.0	14.0			
	20.0		5.0	14.0		0.13	0.43
	65.7	60.0	2.0	1.0	65.0	4.24	3.06
Fishmeal.....	24.0	21.0	2.0	8.0	80.0	0.14	0.55
Gluten Meal.....	38.0	34.0	4.5	8.0	77.9	0.36	0.74
Linseed Oilmeal.....	23.0	17.0	1.0	16.0	70.0	0.24	0.71
Malt Sprouts.....	51.0	45.0	11.3	1.5	71.0	10.00	5.00
Meat Meal, 50% Protein.....	60.0	56.0	10.6	3.0	78.0	6.21	3.42
Meat Meal, 60% Protein.....	41.0	36.0	5.0	7.0	82.0	0.28	0.66
Soyabean Oilmeal.....	50.3	46.3	11.3	2.0	71.5	6.21	3.42
Feeding Tankage, 50% Pro.	61.0	55.0	8.2	1.0	75.0	6.00	3.00
Feeding Tankage, 60% Pro.						22.00	10.90
Bone Char.....						23.00	10.90
Bone Meal (feeding).....	25.8		2.9	0.8		40.00	
Calcium Carbonate.....						38.00	
Limestone (ground).....						28.06	11.8
Rock Phosphate.....							
Alfalfa.....	15.4	11.5	2.6	27.5	5.0	1.43	0.21
Clover.....	13.0	8.2	.3	24.5	51.3	1.10	0.16
Timothy.....	5.9	2.8	2.7	31.1	49.6	0.10	0.12
Corn Silage.....	2.2	1.1	0.8	6.1	15.0	0.07	0.06
Grass Silage.....	3.6		0.5	4.6			
Roots.....	1.2	1.0	0.2	1.3	9.3	0.06	0.04
Oat Straw.....	5.2	1.8	2.3	36.0	41.6	0.30	0.10
Corn Fodder.....	6.5	3.5	2.1	21.7	53.1	0.21	0.14

From "Feeders Guide and Formulae for Feed Mixtures". Published by Quebec Provincial Feed Board.

LIVE STOCK FEEDING

Success in a live stock enterprise depends upon three important factors; namely, suitable feeding, intelligent breeding and an understanding of proper management and marketing methods.

Successful feeding is both an art and a science. An understanding of both factors is necessary, if the best results are to be obtained.

Feeds may be classified into three main groups:—

1. **Concentrates**, including farm grains and mill feeds.
2. **Dry roughages**, such as hays, straws and corn fodder.
3. **Succulent feeds**, as grasses, ensilage, roots or any green crop that is harvested and fed in the green stage.

The chemist and the physiologist study feeds according to their chemical composition and their effect upon the animal. It is customary for scientists to describe the constitution of feeds in terms of six ingredients as follows: **Water**, **Ash** (or mineral matter), **Protein**, **Fats**, **Carbohydrates**, and **Vitamins**.

Feeds vary not only in their chemical composition but also in the digestibility of their various nutrients. Bulky feeds high in fibre are less digestible than feeds which contain little fibre. Roughages that are cut and cured before they are mature or ripe are more palatable and digestible than the same crop cut in a later stage of growth. Feeds that are rich in protein are called nitrogenous, while those high in carbohydrates are known as carbonaceous.

IMPORTANT NUTRITIVE ELEMENTS IN FEEDS

A table of analyses of feeds is shown on page 2. In order that every person may the better understand the significance of that table, we may briefly indicate the uses made of various kinds of nutrients.

PROTEINS—Proteins are exceedingly complex compounds, which always contain the element nitrogen. Some of the better known proteins are albumin of egg, casein of milk and gluten of wheat. Protein is essential for growth, tissue repair, and milk and egg production. Proteins are important because farm feeds are sometimes lacking in this nutrient to properly nourish animals. Because proteins are usually the most costly organic nutrient in feed, no more should be used than is necessary. Feeds high in protein are usually very palatable, and for this reason they are also more valuable.

CARBOHYDRATES—Under this heading may be included such products as starch, sugar, fibre, gums, etc. The compounds are useful for heat, energy and fat production. Most farm grains have a large amount of starch, while roughages are high in fibre.

FATS AND OILS—Fats and oils have the same function as carbohydrates, and because of their high energy value their worth is over twice that of carbohydrates. In addition to their high caloric value,

fats are also important in feeds in maintaining the animal body in a higher degree of efficiency.

MINERALS — Minerals occupy an important place in animal nutrition. They are found in the animal body chiefly in the form of phosphates, carbonates, and chlorides of calcium, magnesium, sodium and potassium. Iron and iodine and a few others are present in small amounts. Most of the minerals are found in the skeleton structure, but they perform other very useful functions. Although a large number of minerals are present in the animal body, only a few of them are important because they are sometimes lacking or present in insufficient amounts in natural foods. The elements that are sometimes lacking are sodium, chlorine, calcium, phosphorous, iodine and iron. With the exception of sodium and chlorine, which are easily supplied in the form of common salt, the other minerals are usually present in sufficient quantities in well balanced rations. There are cases, however, where the soil or water or feed is lacking in one or more of the other elements mentioned above. Iodized salt is generally recommended in Western Canada because in many districts animals suffer from the want of iodine, and iodized salt costs so little more than plain salt that it is considered advisable to use it under all conditions. Some rations are lacking in calcium or phosphorus or both. Experimental results indicate that the animal body needs from .3 to .5 per cent. calcium and .2 to .4 per cent. phosphorus in the dry matter of their feed. Where the soil is depleted of phosphorus and the cattle are fed largely on grasses and cereal straws the animals will show signs of phosphorus deficiency. This condition may be corrected by adding bone meal, bone char, or any other reliable phosphorus mineral.

VITAMINS — Fortunately, although the existence of an imposing list of vitamins has now been established, there are only three (Vitamins A, B₂ and D) which are at all likely to be deficient in ordinary rations of live stock in Manitoba. Deficiency, however, of any one or more of the essential vitamins may result in a seriously disturbed state of well-being and all that such entails—lower growth rate, higher food consumption per unit of product, lowered resistance to disease and even death. Pasture, succulent green feed, leafy and green dried forage and the farm-grown grains, supply most of the essential vitamins. Where such is not the case it is indicated in different sections of the bulletin how the deficiency can be met.

ESSENTIALS OF A GOOD RATION

From what has been said it will be apparent that a suitable ration should contain all the required ingredients in suitable proportions to meet an animal's needs. In addition, the ration should be economical to supply, palatable to the taste, healthful and so far as it is possible farm grown. In computing a live stock ration one must take into consideration not only its chemical composition, but its cost and its effect upon the animal. Feeding standards are useful as guides and should be adhered to within certain limits, but under certain circumstances, because of cost and the lack of certain feeds, rations may be used that are somewhat out of balance.

GENERAL COMMENT ON VARIOUS KINDS OF ANIMAL FEED

ROUGHAGES

There is a great deal of difference in the value of different types of roughage produced and used in Manitoba. The principal roughages used are native hay, threshed straw, alfalfa hay, sweet clover hay, tame grass hay (brome, timothy, western rye, etc.), cereal hay (mostly oats cut green), ripe oat sheaves, corn fodder and corn ensilage.

Reference to the table on page 2 will give a good idea of the relative value of most of these feeds. One must remember, however, that there is a great difference in separate samples of the same general class of fodder. Probably this is more true of native hay than of any other feed. Well cured native hay, cut before the grass has ripened, may be fine and well supplied in nutrients; or it may be full of fibre, coarse, unpalatable and innutritious.

Alfalfa and clovers are high in protein and rich in lime, and the use of good quality hay of these classes will make possible a reduction in cereal feeds.

THRESHED STRAW is low in protein and very high in indigestible fibre. Horses, cattle and sheep, however, require bulk in their feed, and when hay is scarce, or even absent entirely, straw supplemented by some threshed grain will not only carry animals through the winter, but, if enough grain is used, horses may use straw as part or all of their roughage and do hard work; or beef animals may be fattened on such a ration. The tendency, however, in all such cases is for the animal to eat little straw. All feeders, of course, know that chaff is better than coarse straw. In actual practice, straw furnishes a considerable part of the maintenance ration on which many animals—far too many—are overwintered. No good feeder will ever despise the value of good straw, but he will also realize that by itself it is a very poor feed, and he will know that if animals have only straw far too many of them will die of starvation. Oat straw is usually the best of the straws, barley straw next, and wheat or rye straw about the poorest. If the crop has been cut while underripe, the straw contains more nutrition than straw that is fully ripe.

OAT SHEAVES are simply equal to so much oat straw plus so much grain, but they have the advantage that the straw and the grain will be eaten together rather better than if they were fed separately. In this way the oat kernels are possibly masticated somewhat more thoroughly.

CORN FODDER and ENSILAGE are both valuable — the latter especially so — because of the variety which it gives to the diet, and because good ensilage provides Vitamin A, a nutrient frequently lacking in winter rations.

CUTTING AND GRINDING ROUGHAGES — Good quality roughages require no special preparation in the way of cutting or grinding. Cutting or grinding are expensive operations and they add nothing to the

value of good feed. The cutting of low quality feeds allows such feeds to be mixed with others that are more palatable and thereby make the whole mixture more desirable. Cutting facilitates the storage of rough feeds as cut feeds require less space than uncut feeds. The grinding of a roughage is an expensive operation and feeding results indicate that ground feeds are no more palatable or digestible than cut feeds.

ROOTS

The table does not contain any reference to roots—turnips, mangels, beets and carrots. Trials as to the relative value of roots and threshed grains have given widely varying results. On the average 100 lbs. of meal would be worth about 500 to 600 lbs. of roots; but the value of roots is greatest when fed as only a small portion of the diet rather than extensively. Roots have a laxative effect upon animals that are on dry feeds; they promote general health and thriftiness.

CONCENTRATES

The concentrates used in Manitoba are mostly barley, oats, wheat, corn, wheat middlings, shorts, bran, oil cake and various mixed meal feeds, some of which contain mineral or high protein supplements. As the adaptabilities of most of these are discussed in relation to their value for feeding various types of animals in the chapters that follow, discussion of them is passed over here. Fine grinding is neither necessary nor desirable, and wheat in particular should not be finely ground.

Horses differ from other farm livestock, being more restless; even idle horses move about considerably and require adequate feeding. More young horses are stunted, and therefore ruined, from under-feeding than from over-feeding.

HORSE FEEDING

THE PREGNANT MARE (WORKING)

Feed mares more liberally than ordinary work animals. Oats are the safest and best grain and should be fed at the rate of from $\frac{3}{4}$ lb. to 1 lb. of oats to every 100 pounds a mare weighs; e.g., a 1,000-pound mare would receive from $7\frac{1}{2}$ to 10 pounds of oats per day, while a 1,500-pound mare would receive from $11\frac{1}{4}$ to 15 pounds per day. Hay at the rate of one and one-tenth pound for each 100 pounds the mare weighs should be fed daily. If possible, this hay should be half timothy or wild hay and half alfalfa or sweet clover. Alfalfa and sweet clover hay supply more protein, minerals and vitamins than do timothy or wild hays.

About the seventh or eighth month feed 5 pounds of bran with 5 pounds of oats daily. Allow moderate exercise up to date of foaling; light work is satisfactory, but the mare must not be required to strain when working.

THE PREGNANT MARE (IDLE)

If a mare does not require to work while in foal, she should be fed on a basis similar to a horse doing light work; namely, about 10

pounds of grain and 26 pounds of hay or green feed per day. The grain should consist of: oats, 8 pounds; and bran, 2 pounds.

If iodized salt is not used continuously, it is advised that each pregnant mare be given **one teaspoonful daily** (on the grain) of a solution made by dissolving six drachms of potassium iodide in one quart of water. The bottle in which this is kept should be tightly corked.

BROOD MARE AND FOAL

Immediately after foaling give the mare one-half pailful of warm water to which has been added a double handful of rolled oats. Half an hour afterwards follow this with a small warm bran mash. For the first five days feed sparingly, but give a bran mash each night. From five days onward gradually increase the feed until she is receiving similar amounts of oats and hay as are given for idle pregnant mares.

Allow the mare to remain idle for at least two weeks after foaling; longer if possible. If it is necessary to work the mare, never allow the foal to follow his dam at work, as foals so treated will lose flesh. Good growth and condition are achieved most easily in the suckling foal; furthermore once lost these are difficult to recover.

Encourage the foal to eat grain when from two to three weeks old. Place a separate feed box in the box stall at a height which is neither so low that the foal has to spread his legs to eat nor so high that he has difficulty in eating from it. Tie the mare to prevent her stealing the foal's ration. First feed a mixture of one-half pound oats to one-half pound bran; when the foal eats this amount, gradually increase the allowance on the basis of two parts oats to one part bran by measure until the daily weight of oats and bran is two pounds. This amount should be divided and given as two feeds, morning and night. Some clean alfalfa, sweet clover, timothy or wild hay should be available.

Two pounds of grain per day is sufficient until weaning, when the foal is from five to six months of age. Feed the weaned foal grain twice a day, giving an amount he can consume in one-half hour, morning and night. Small amounts of good, clean, well-cured hay should also be fed morning and night. The grain and hay ration should be gradually increased to take care of natural growth and development.

If so fed, the foal, when one year old, should weigh one-half of his mature weight. When two years old the horse, if properly fed and developed, should weigh three-quarters of the weight he will be when matured at seven years of age.

Experiments over a ten-year period and involving 62 horses, made at an American experimental station, indicate that foals may be raised from the age of seven months until they are two years old on approximately 1,500 pounds of grain; 3,000 pounds of hay (alfalfa), and 5,000 pounds of sheaf oats.

From two to three years of age the colt requires 1,200 pounds of grain, 3,000 pounds of alfalfa or sweet clover hay and 2,000 pounds of sheaf oats or other roughage, as well as access to good pasture from Spring until Fall.

THE UNDERNOURISHED OR ORPHAN FOAL

If a mare dies at foaling, or while the foal is nursing, or has not sufficient milk, it is not difficult to raise her orphan; but regularity and cleanliness are absolutely essential, combined with the system of feeding "little and often."

If the mare dies before the foal has a chance to suck, give the foal the white of one fresh egg, then give an injection of one quart of soapy water (luke warm). If the foal continues straining, give another injection in one hour.

Cow's milk, low in butter fat, is the most practical substitute for mare's milk. To one pint of cow's milk add one-quarter pint of lime water and one tablespoonful of white sugar. Dissolve the sugar in a little hot water, then add to the milk and lime water. This amount makes sufficient for two feedings until the foal is two weeks old. Warm the mixture to blood heat (about 100°F.) and feed, using an ordinary baby's bottle and nipple.

The following feeding schedule will be useful:—

Age	Feed	Amounts to Feed	Times to Feed
Birth to 2 weeks	Sweet milk—1 pint Lime water— $\frac{1}{4}$ pint White sugar—1 tablespoonful	One-half pint	Every hour
2 to 3 weeks	Same as above	One quart	Every 4 hours
3 to 5 weeks	Same milk and lime water as above. Reduce sugar to one-half tablespoonful.	One quart or more according to size and appetite.	Every 6 hours
5 to 8 weeks	Same as above, but if skim milk is gradually substituted, omit the lime water.	One quart to one and one-half quarts.	Every 6 hours
8 to 12 weeks	Sweet milk with lime water, or skim milk alone.	Sufficient to satisfy	Every 8 hours

When about two weeks old after each feeding a small amount of crushed oats should be put in the foal's mouth. This prevents such bad habits as windsucking from developing and also gets the foal acquainted with eating grain. As soon as the foal will eat grain, feed as outlined under "Brood Mare and Foal."

If an orphan foal shows any indication of scouring, give two tablespoonfuls of castor oil mixed with milk. If scouring persists, stop feeding milk for two or three meals and replace the milk by warm water to which the usual sugar and lime water is added.

WORK HORSES

The work horse, for each 100 lbs. live weight, requires daily from one to one and one-half pounds of grain and from one to one and one-half pounds of fodder depending upon the type and quality of fodder. If a horse is at hard work and is suddenly laid off, cut the grain ration by one-half and increase the hay by a similar amount.

These amounts may be increased or decreased, depending upon whether the horse is at exceptionally hard work or only at light work. for example (for a 1,600-pound horse):

Hard work —Grain 20 lbs. Hay or green feed 16 lbs.

Medium work—Grain 16 lbs. Hay or green feed 20 lbs.

Light work —Grain 10 lbs. Hay or green feed 26 lbs.

Some Daily Grain and Forage Rations:—

Ration 1		Ration 2		Ration 3	
	Pounds		Pounds		Pounds
Oats	10	Oats	8	Oat hulls	8
Wheat, barley or both mixed	8	Wheat, barley or both mixed	8	Wheat, barley or good screenings	12
Bran	2	Oat hulls	4		20
	20		20		20
Slough grass hay	4	Prairie hay or timothy	12	Alfalfa or sweet clover hay	8
Alfalfa or sweet clover hay	12	Oat sheaves	4	Prairie hay or timothy	8
	16		16		16

Where the forage contains inedible matter allowance should be made.

It does not matter whether a horse is watered before being fed grain or afterwards, but never fully water a horse when sweating. Allow him only a few swallows, then feed some hay and let him cool.

If a horse is ravenously hungry, feed hay first and grain afterwards.

Morning feed—6 lbs. grain and 5 lbs. hay or green feed.

Noon feed—6 lbs. grain and 6 lbs. hay or green feed.

Night feed—8 lbs. grain and 9 lbs. hay or green feed.

THE STALLION

More stallions are rendered useless through over-feeding and lack of exercise than perhaps any other type of livestock. Thriftiness and vigor without being overfed should always be aimed at in stallion management. This, however, cannot be accomplished unless, in addition to good clean feed, the stallion receives sufficient exercise to keep him healthy. The best and cheapest exercise is work; even during the breeding season half a day at work is advisable.

The stallion can be fed any of the grain rations suitable for work horses, but during the breeding season extra food is necessary. All stallions should be kept in good flesh but not fat. During the breeding season they should be kept gaining a little in weight rather than being allowed to lose flesh. A small armful of green grass should be given each night.

SALT—Salt (iodized) should be available at all times for all classes of horses.

DAIRY CATTLE FEEDING

Milk yield is dependent on three factors—cow, feed and man. But no matter how efficient a cow is—by virtue of breeding—unless the feed provided is adequate in amount and quality, she cannot produce to the limit of her inherited capacity. Thus it has been demonstrated that an improved feeding programme can account for a fifty per cent. increase in production in exceptional cases, such as cows previously on a low plane of nutrition.

What follows is considered to be the essential structure of a feeding regime suited to general conditions prevailing in Manitoba.

COWS IN MILK

1. Water always allowed ad lib.

The requirement of producing cows is 12 to 15 gallons daily.

2. Hay should always be fed to the limit of consumption. A normal consumption is 2 to 2½ lbs. per 100 lbs. live weight daily.
3. Less hay is consumed when silage also is available. A normal consumption of the mixture is 1 lb. hay and 3 lbs. silage per 100 lbs. of live weight daily, which involves about 35 lbs. silage per head per day.
4. Grain feeding (in conjunction with hay as indicated).
To cows producing milk testing 4% butter fat or less:
Feed 1 lb. meal to each 4 lbs. milk produced.
To cows producing milk testing 5% butter fat or over:
Feed 1 lb. meal to each 3 lbs. milk produced.

5. Cows on pasture:

Cows on good pasture and producing less than 30 lbs. milk do not require grain. Cows on good pasture producing over 30 lbs. require about 1 lb. grain for each 3 lbs. milk produced above 30 lbs.; e.g., a cow producing 40 lbs. of milk on good pasture would receive 3 lbs. grain.

FORMULATING THE GRAIN MIXTURE:

The basis of all grain mixtures for dairy cows under Manitoba conditions consists of oats, barley, wheat, re-cleaned screenings and bran. These are largely interchangeable. Whether it is advisable to supplement the basal grain mixture with a protein concentrate depends on the milking efficiency of cows and the quality of roughage fed.

The farm-grown grains alone, when fed with roughage of which two-thirds is legume, will support a moderately high level of production but an all-grass or cereal hay requires that the basal grain mixture be supplemented with a protein concentrate to the extent of about 17%.

SUITABLE SAMPLE CONCENTRATE MIXTURES

A.—Where only grass or cereal hay available:	Mixture No.			
	1	2	3	4
	lb.	lbs.	lbs.	lbs.
Oats	567	704	607	543
Barley .....	....	....	....	166
Wheat .....	....	....	97	....
Wheat Screenings	234	....	....	....
Wheat Bran .....	....	97	....	97
Shorts .....	....	....	97	....
Linseed Oil Meal	169	169	169	174
Iodized Salt	15	15	15	15
Bone Meal	15	15	15	15
	1,000	1,000	1,000	1,000

B.—Where two-thirds or more of the roughage is legume (Alfalfa, Sweet Clover):	Mixture No.			
	1	2	3	4
	lb.	lbs.	lbs.	lbs.
Oats	679	873	679	679
Barley	282	....	97	281
Wheat .....	....	97	....	....
Wheat Screenings .....	....	....	194	....
Wheat Bran .....	....	....	....	10
Linseed Oil Meal	9	....	....	....
Iodized Salt	15	15	15	15
Bone Meal	15	15	15	15
	1,000	1,000	1,000	1,000

MEETING THE MINERAL NEEDS:

Bone meal or mono-calcium phosphate and iodized salt if supplied regularly meet all of the mineral requirements. These should always be incorporated in the grain mixture, each at a level of 1½%. In addition it is well to test for salt hunger by offering iodized salt in the mangers, once a week. Stock not receiving grain or when at pasture should have free access to a mixture of equal parts bone meal or mono-calcium phosphate and iodized salt.

GENERAL POINTERS:

Legume hays (alfalfa and clovers) constitute the sheet anchor of successful dairying. Intelligent and economical feeding is not possible lacking information as to daily milk production.

It pays to bring cows to the calving in relatively good condition. This involves an adequate rest period—not less than sixty days and preferably ninety days.

During the dry period feed enough grain to enable cows to gain steadily in condition. This in general calls for a daily allowance of about 6 pounds. Feed lightly (mostly bran) for several days before and after calving.

Grinding of grain is necessary to avoid loss in feces but fine grinding involves needless cost. Medium coarse grinding is sufficient.

DAIRY CALF FEEDING

The most practical and economical way of raising dairy calves is by use of a minimum of whole milk and the balance skim. Calves should remain with their dams for the first two days and in any case the dam's milk only should be allowed for the first week. The feeding regime recommended is as follows:

The amount of milk fed should be regulated in accordance with live weight; being 10% thereof. Thus a calf weighing 90 pounds would receive 9 lbs. milk per day, with an upper limit for either whole or skim of 18 to 20 pounds. One quart of milk weighs $2\frac{1}{2}$ pounds. The whole milk period is 4 weeks when the substitution of skim may begin, but it is important that the substitution be gradual. Skim milk feeding is continued until the calf is six months old when normally it is weaned on to a diet of hay and grain or pasture.

ROUGHAGE AND GRAIN FEEDING:

The calf should be started early—3 weeks of age—on both roughage and grain. Little is consumed at first but the calf can be tempted to eat by replacement each day with choice and fresh hay and grain. Green leafy hay is best. The grain mixture recommended for milk cows is satisfactory for calves but the quantity allowed should be regulated. Allowing 1 pound for the first 100 pounds weight of the calf and $\frac{1}{2}$ pound for each additional 100 pounds will promote satisfactory growth which, measured in terms of daily weight increase, should be about $1\frac{1}{2}$ pounds.

Hay should always be fed to the limit of consumption.

WATER AND MINERALS:

Fresh water is essential and ideally it should be constantly available. Incorporating $1\frac{1}{2}\%$ each of iodized salt and bone meal or mono-calcium phosphate, in the grain mixture will meet the calf's mineral needs.

PASTURING CALVES:

It is not advisable to turn calves to pasture before 5 to 6 months of age.

MANAGEMENT POINTERS:

Cleanliness is the watchword in calf raising by the pail method. Pails and all utensils should be washed and scalded after usage.

Damp, ill-ventilated and foul pens are very detrimental to calf health.

Fresh milk only at approximately blood heat should be fed. Three feeds a day for the first 7 to 10 days of the calf's life is in order and thereafter twice a day. Milk from diseased cows should not be fed or at all events it should first be pasteurized.

BEEF CATTLE FEEDING

Beef cattle raising is best adapted to districts or farms where grass and forage is cheap and plentiful, where water is easily obtained and where a considerable portion of the land is unsuited for the production of cultivated crops. Beef cattle raising provides a means of marketing crops that otherwise have little or no market value.

The fattening of cattle is frequently done on the farms where the cattle were raised. To properly finish cattle requires heavy grain feeding for a period of some months. The fattening of cattle on farms that are adapted only for grass and forage growing is a questionable venture, as purchased grains would have to be obtained. On the other hand, the raising of beef cattle on land that is well suited for grain growing and unsuitable for the production of pasture is not to be recommended. On such farms the fattening of cattle would be a more suitable enterprise.

WINTER FEEDING OF THE BEEF BREEDING HERD

An ample supply of suitable fodder to carry the breeding herd through the winter should be provided. The ration must be economical, have some variety and contain sufficient organic and mineral nutrients to keep the animals healthy and in good condition. If the feed has been well harvested and preserved, less grain will be needed to keep the herd in condition.

BEEF BREEDING HERD—RATIONS FOR WINTERING

Cattle eat between two and three pounds of dry roughage per day per 100 lbs. of live weight. Ensilage may replace a portion (one-half) of the dry roughage. Three pounds of ensilage will replace one pound of dry roughage. If half or more of the roughage is well cured legume hay, (alfalfa, sweet clover or other clovers) little, if any, grain will be needed to maintain the herd in good breeding condition. Milking cows and cows nursing calves should be fed grain in addition to the roughage.

Feeds vary widely in their chemical content and feeding value due to soil, climate, variety and the methods followed in harvesting and storing. Because of this wide variation, it is not the intention of the Board that the rations suggested should be followed to the letter.

SUGGESTED RATIONS FOR WINTERING BEEF CATTLE

1. Equal parts legume hay and straw.
2. Equal parts legume hay, straw and oat sheaves.
3. 20 to 30 lbs. ensilage; 10 to 20 lbs. straw and sweet clover (half and half).
4. One part corn fodder, one part straw, two parts legume hay.

Grain should supplement the roughages whenever the condition of the stock indicates the need for added feed. The breeding herd should at all times be maintained in a thrifty healthy condition.

FATTENING STEERS

The fattening period varies from three to six months, depending on age and condition of the cattle and quality of the feeds.

Cattle should be fed about equal parts, by weight (that is, pound for pound), of grain and dry roughage. Three pounds of ensilage will replace one pound of dry roughage.

The ration should consist largely of roughage at the beginning of the feeding period; later as the grain ration is increased the animals will take less roughage.

The hay should be green, leafy, well cured and contain some legumes. Water and **iodized salt** should be available at all times.

GRAINS FOR BEGINNING OF FEEDING PERIOD

A suitable grain mixture for the early part of the feeding period is composed of:—

1 part crushed or rolled oats,

1 part crushed or rolled barley.

Crushed wheat, corn, or screenings may replace part or all of the barley allowance, depending on their condition, quality and value.

The allowance of grain at the beginning should be restricted to a few pounds per day and the amount gradually increased as the animals accustom themselves to eating grain.

GRAINS FOR FINISHING PERIOD

The grain ration for the finishing period should consist largely of the starchy cereals such as barley, corn or wheat, or a mixture of them. Usually it is advisable to add oats to the extent of one-quarter of the grain ration, although it might be advisable to add more if the rest of the grain is made up of wheat or wheat screenings.

Usually it is advisable to add at least 5 per cent. of linseed oil meal to the farm grains. Its economic use will depend upon its relative cost to farm grains and the kind and quality of the roughage used. There is less need in the ration of a high protein feed, such as linseed oil meal, when the roughages contain clovers, such as alfalfa or sweet clover. Linseed oil meal is a valuable supplement to rations consisting of grass hays and farm grains. It not only adds some needed protein, but it also improves the palatability and stimulates the appetite of the animals.

FEEDING BABY BEEF

(425 lbs. at beginning to 900 lbs. finished weight)

Feed fine, well-cured roughage.

Legume hay (alfalfa, sweet clover, etc.) should comprise a portion of the roughage. Overfeeding with legumes sometimes produces an undesirable laxative condition.

Feed a larger proportion of roughage to grain at the start of the feeding period.

The grain feed for the first week should be largely oats, possibly 75 per cent. oats and 25 per cent. barley. As the feeding period advances the proportion of oats and barley should be reversed.

Limit grain at the start, but gradually increase amount until the calf is daily eating 1 to 1¼ lbs. of grain per 100 lbs. of live weight.

A protein supplement, such as linseed oil meal, should be added to the grain to the amount of 5 per cent. of the grain feed if the roughage is non-legume hay.

A mixture of grain is better than a single grain. Feed wheat, if not out of line in price with barley, may replace a portion of the barley.

Rapid fattening is associated with heavy grain consumption. About two-thirds of the ration of the full-fed calf should be grain, that is, two pounds of grain to one of hay or other roughage.

Rickets, or a stiffening of the legs, sometimes affects calves on heavy grain feeding and in close quarters. To avoid this condition, place some finely ground limestone and salt in separate containers and allow the calves to consume all they want. Some outdoor exercise will help to keep the calves in condition.

One feed a day of boiled barley may replace an equal portion of the ground feed and add variety and palatability to the ration.

Fresh water should be available at all times, if possible. If not, cattle should be watered at least twice a day. Use tank heater in severe weather.

SUGGESTED RATIONS FOR BABY BEEVES

Beginning of Feeding Period (after first week), for two months.—5 parts oat chop; 4 parts barley chop (or feed wheat and barley); 1 part linseed oil meal.

Finishing Period or FULL-FEED Period.—The proportion of barley or barley and wheat will be gradually increased, and calves may be considered on full feed when consuming 1 to 1¼ lbs. per 100 lbs. of live weight of the following mixture: 6 parts barley, or barley and feed wheat; 3 parts oat chop; 1 part linseed oil meal.

NOTE.—Feed wheat may replace at least half the barley, and wheat bran may replace half the oats.

MINERAL NEEDS OF BEEF CATTLE

With the exception of salt and iodine the mineral needs of beef cattle are in general met by the ordinary feeds. Grasses and roughages are frequently low in phosphorus. When cattle are fed over long periods on pasture and low quality roughages they may show evidences of phosphorus deficiency. In such cases they should be given a phosphorus supplement such as bone meal or any other equally suitable phosphorus mixture. Grains on the other hand are low in lime. Fattening cattle, on full grain feed, usually requires extra lime. When this is the case finely ground limestone should be fed. As a safeguard both limestone and the bone meal should be provided by placing them in a box or trough. The salt, limestone and bone meal should be fed separately and the animals allowed to consume the amount they require.

SHEEP FEEDING

Sheep are naturally adapted to grazing on pastures and ranges that supply a variety of forage plants. They prefer short choice grass, legumes and lush palatable weeds. Small farm flocks of sheep usually do well under Manitoba conditions. During periods of extreme droughts or overstocked pastures, suitable roughage, grain and mineral supplements are required. The yields of lamb and wool depend largely upon breed, feed, care and management of the flock, particularly during the fall and winter months.

FEEDING THE BREEDING EWE

Ewes should be in a gaining condition, at the time of breeding, if a large lamb crop is to be expected. Not only are more lambs produced, but ewes come in heat more promptly and the lambing season is shortened. To obtain this result the flock should be given access to good pasture, such as rape, a good hay aftermath or grain stubble, for two to three weeks before breeding. If no pasture is available, or the season does not allow satisfactory grazing, a little grain should be given— $\frac{1}{4}$ to $\frac{3}{4}$ pounds per ewe per day for one month should be sufficient—to condition the ewes.

Legume roughage of good quality provides ample nutrients for the breeding ewe during the early period of pregnancy. To provide for the rapid growth of one or more unborn lambs during the last month of pregnancy; to provide nutrients for growth of wool; maintenance of body weight; to assure that the ewe is in condition to supply milk for the new born lambs, a liberal supply of legume roughage, some concentrates and a mineral supplement should be provided. The absence of a green roughage over a long period, together with the lack of minerals, is likely to produce a condition in the flock known as "pregnancy disease of sheep." When this condition occurs there are serious losses in both ewes and lambs and frequently shedding of fleeces.

A ewe will eat from 3 to 5 lbs. of roughage a day depending upon her size and the quality of the feed. Legume hay (alfalfa, sweet clover or other clovers) is the best roughage and should be the basis of winter rations. Corn silage, free from molds or pulped turnips, fed at the rate of two to three lbs. per day, will aid in keeping the flock in a thrifty condition. Coarse stemmed, ripe grass hays, lowland hays and wheat straw are most undesirable feeds. When a good roughage is used and late lambing is followed, little if any grain is necessary.

When the roughage is poor and the ewes are thin, some grain will be required to keep the flock in a thrifty condition. Oats with either barley, wheat or wheat screenings are suitable. Coarse grinding of grains is advantageous but not absolutely necessary. Under these conditions from $\frac{1}{2}$ to $\frac{3}{4}$ lbs. per ewe per day should be fed.

ENSURING WELL-FINISHED LAMBS

Strong, healthy, vigorous lambs cannot be produced unless pregnant ewes have adequate exercise. This exercise is induced by spreading a portion of the winter roughage on the ground in a well sheltered yard or by feeding the roughage some distance from the shelters. Ewes that lamb during the months of February, March and early April require a

liberal supply of feed to ensure that lambs receive nourishment. The best way to feed a lamb is through the ewe. Well-cured legume hay is most valuable at this time and in addition, the grain ration should be increased to about $1\frac{1}{2}$ lbs. per day.

Rapid growth and fattening is most important in early dropped lambs intended for the early market. Supplementing its dam's milk with grain, in a creep, will assist in getting the lamb ready for market at an early age. Three parts good oats and one part wheat bran, is an excellent mixture for creep-feeding. The value of the additional weight on early lambs fed grain is usually more than enough to pay the cost of grain consumed. The practice of raising early lambs is not recommended where suitable accommodation is not available and where the farmer does not provide legume hay or other suitable feed such as wheat bran or linseed oil meal.

Lambs dropped in late April or early May should reach market from late August to October direct from the ewes. These lambs are for the most part finished on pasture, meadow aftermath, and in grain stubble.

FALL FATTENING OF LAMBS

Late born and unfinished lambs of the smaller breeds should be put on full feed in a dry lot. Sixty to ninety days on full feed should put the lambs in good condition for marketing. A grain mixture of oats, barley and wheat screenings should prove satisfactory. Oats may be fed whole but the barley and wheat screenings should be ground.

Use a good quality fine stemmed roughage. A legume hay will be found to be the most satisfactory fodder; however, any well cured green hay will serve well as a feed for fattening lambs. When on full feed, a 60 to 75 pound lamb will consume daily two pounds each of grain and fodder—salt and water are necessary at all times. A thrifty lamb on full feed should make gains of one-quarter to one-third pounds daily.

Iodized Salt should be provided at all times. Especially during winter months, pregnant ewes should be given salt to which potassium iodide has been added, at the rate of $\frac{1}{2}$ ounce per 100 lbs. The salt and iodide must be thoroughly mixed. Block salt should not be used for ewes during the winter. They are unable to get sufficient of it and it may cause sore mouths.

For further information on sheep see Publication No. 191, "Sheep Production Pointers."

SWINE FEEDING

USE OF FARM GROWN GRAINS FOR SWINE FEEDING

BARLEY is the standard feed for swine in Western Canada, and when available it should be the first choice. It is suitable for use in rations for growing and finishing bacon hogs, and for breeding stock. Barley should be ground to a medium fineness in preparation for feeding. Where grinding cannot be undertaken, soaking the whole grain for ten to twelve hours will prove advantageous. There is no advantage to be gained through the soaking of ground feed.

OATS on account of being high in fibre is not the most suitable feed for market pigs. Oat hulls are harmful to weanlings. For older pigs the hulls have no feeding value but they are not injurious. Oats should not be used in excess of 10 to 20 per cent. of the total meal ration for growing or finishing market pigs. For nursing sows and breeding stock larger percentages may be used to advantage.

WHEAT—The results of recent feeding tests show wheat to be worth slightly more than barley, pound for pound, when included in the meal mixture in amounts not exceeding fifty per cent. The use of larger percentages of wheat in the meal mixture may cause digestive troubles, and may also cause over-finish and a lower rail grade. The danger of over-finishing is reduced when a suitable protein supplement is fed during the growing period. Wheat should be coarsely ground or rolled. Finely ground wheat is less palatable and more difficult to digest.

MILLET of the proso type can be employed up to fifty per cent. of the total meal mixture. It should be ground and fed with either oats or barley. When used to supply not more than fifty per cent. of the ration, millet is almost equal to barley in feeding value.

RYE is the least desirable of the farm grown grains for swine feeding. It can be used to best advantage in the fattening ration. Rye containing ergot is very unpalatable to all classes of livestock. It should not be fed to pregnant animals.

PREPARATION, MIXING AND FEEDING:

A mixture of meals is usually superior to one kind fed alone. Finely ground meals are usually better fed as a slop than dry. Coarsely ground meals may be fed freshly mixed with water or dry, according to the convenience of the feeder.

For creep feeding and for newly weaned pigs, the oats and barley after being ground, should be sifted through mosquito netting or other fine mesh screen in order to remove a portion of the hulls. Coarsely ground grains are more palatable to young pigs than grains finely ground.

Young pigs up to 110 pounds and sows nursing litters should be fed three times daily. Well grown market pigs and breeding stock need be fed only twice daily.

MEAL MIXTURES FOR GROWING AND FINISHING PIGS

Several mixtures of farm grown grains, when properly supplemented with protein, minerals and vitamins, will prove satisfactory for feeding market pigs. Seven suggested mixtures are outlined below. All of these are suitable for pigs between weaning age and market weight, and the feeder may choose the one that best suits his feed supply. Frequent or abrupt changes in the meal mixture should be avoided. Meal mixture No. 7 is the one used in the Advanced Registry Feeding Stations. The mixture marked "a" is fed until an average weight of 110 pounds is reached and the mixture marked "b" is then fed until market weight is reached.

MEAL MIXTURE FOR GROWING AND FINISHING PIGS:

Meal Mixture	Ground Barley	Ground Oats	Coarsely Wheat	Ground Millet
	lbs.	lbs.	lbs.	lbs.
No. 1	50	....	50	....
No. 2	75	....	25	....
No. 3	90	10	....	....
No. 4	100	....	....	....
No. 5 .....	....	20	50	30
No. 6	30	20	....	50
No. 7 (a)	50	25	25	....
No. 7 (b)	60	10	30	....

THE ESSENTIAL SUPPLEMENTS

Good feeding is the keystone in successful swine production. Pigs grow rapidly, and it is essential that the feeds used be well balanced and complete. The use of unsuitable feeds causes pigs to become unthrifty, and to make slow unprofitable gains. Deficient or unbalanced feeds are frequently the cause of ailments and increase the susceptibility to disease which, in turn, causes a high mortality. The meals from farm grown grains alone will not supply a complete ration for pigs that are growing nor for brood sows during pregnancy and nursing. **Rations made up entirely of cereal grains are low in protein, minerals, and vitamins and rarely—if ever—prove the most economical.**

PROTEIN:

The rate of growth of pigs is largely determined by the amount and kind of protein in the ration. Milk, tankage, meat meal, fish meal and commercial hog concentrate are all suitable protein supplements for use with meal from cereal grains in the feeding of growing pigs.

Milk is an ideal supplement for use with farm grown grains. Two to three pounds of milk to each pound of meal are required for young growing pigs. Where supplies of milk are not available or are insufficient, a feed containing a high percentage of protein should be purchased. To meet the needs for extra protein, tankage or meat meal alone may be purchased; or the ingredients may be purchased for making up a home-mixed supplement such as employed by the Advanced Registry Feeding Stations and outlined below; or one of the ready-mixed commercial hog concentrate may be obtained.

Protein feeds are relatively more costly than the other ingredients in the ration, and feed mixtures should be compiled to obtain the maximum benefit from the amount used. The pig's greatest need for protein is when it is growing. The most economical plan is to include a generous allowance of protein in the feed mixture when the pig begins eating from a trough and gradually reduce the allowance as the pig develops. This means that the highest percentage of protein supplement is used in the ration during the period when the daily feed consumption is small. The following table outlines suitable allowances of supplement in the feed mixture during the different stages of the pig's development.

Suitable Amounts of Supplement (containing about 45 per cent. of Protein) and Ground Grains for Market Pigs at different stages of growth and finishing:

	Protein Supplement	Ground Grains
1. Creep feeding and for pigs weighing up to approximately 40 pounds	100 lbs.	350 lbs.
2. For Pigs weighing from 40 to 100 pounds	100 "	700 "
3. For pigs weighing from 100 to 150 pounds	100 "	1,400 "
4. For pigs weighing 150 pounds to market weight	100 "	1,900 "

Changes in the allowance of Supplement should be made gradually, rather than abruptly as indicated in the table. The amount of protein supplement requirement per pig reared to market weight is approximately fifty pounds.

The combined protein-mineral supplement used in the Advanced Registry Feeding Stations is made up of:

Tankage (50% protein)	50 pounds
Fish meal	15 pounds
Linseed oil meal	25 pounds
Ground limestone	5 pounds
Iodized salt	5 pounds

The linseed oil meal in the above mixture may be replaced by 30 pounds of ground peas. (If peas are used, 105 pounds of supplement instead of 100 as suggested in the above table should be allowed.) Feeding bone meal may be used to replace ground limestone.

MINERALS:

Calcium and salt are the two minerals most likely to be deficient in swine rations. Salt is required regularly but it is necessary that it be well mixed in the feed at the rate of $\frac{1}{2}$ to one pound for each hundred pounds of meal. Salt may be included in the protein-mineral mixture, or may be included in a home-mixed mineral mixture such as outlined below.

Growing pigs require more calcium than is contained in cereal grains. The deficiency of this mineral can be overcome by feeding milk by the addition of ground limestone, or by supplying one of the suggested mineral mixtures:

Mineral Mixture No. 1

Slacked coal	50 pounds
Ground limestone	30 pounds
Iodized salt	20 pounds

Mineral Mixture No. 2

Feeding bone meal	60 pounds
Wood ashes	20 pounds
Iodized salt	20 pounds

Mineral Mixture No. 3

Feeding bone meal	8 pounds
Ground limestone	14 pounds
Iodized salt	8 pounds
Ferrous sulphate	3 ounces

A mineral mixture, such as one of the above, may be given in a self-feeder or supplied in a separate box where the pigs have constant access to it. The mineral mixture should be protected from rain.

VITAMINS—Growing pigs that are kept indoors during the summer, away from green feed and direct sunlight, and all growing pigs during the winter months, suffer from lack of vitamins. Fish oils, such as cod liver oil and pilchard oil, are an excellent source of vitamins “A” and “D” which are needed to promote growth and to prevent nervous disorders and the occurrence of rickets. Fish oils that have been processed for feeding purposes contain 1,000 to 1,500 International units of vitamin “A” and 200 of vitamin “D.” Young pigs should receive a teaspoonful each, daily, in their feed until a weight of 100 to 120 pounds is reached. It is a convenient plan to provide a small container which will hold the required amount of oil for the group of pigs for each feeding. When purchasing oils for feeding purposes, the vitamin potency should be ascertained. Two to three pints of oil are required to provide this protective feed for each growing pig.

THE SELF-FEEDER — The self-feeder has proved a very satisfactory means of feeding market pigs from weanlings to finished weight. Usually the feed consumption per hundred pounds of gain is only slightly higher with this method than with hand-feeding. When labour is scarce, the self-feeder is particularly useful. A constant supply of water is essential with this plan of feeding. A leaflet showing the construction of the self-feeder is available upon request.

PASTURE CROPS AND HOGGING OFF

Rape, millet, fall rye, oats, or a mixture of cereals are annual crops that are suitable as hog pastures. Rape has the greatest carrying capacity, but early sown oats will provide forage for a month to six weeks earlier in the season. Rape does not do well in a mixture with grain crops, and it cannot safely be seeded until the end of May or early June. A mixture of two bushels of oats and one bushel of fall or winter rye, seeded early in the spring makes an excellent pasture. The oats grow quickly and supply feed for the late spring and early summer while the rye provides green feed during the late summer and fall.

The use of pasture reduces the need for supplementary protein, minerals, and vitamins in the ration. The time required to develop a hog to market weight on pasture is longer than with inside feeding. Hogs on pasture should receive a full ration of meal.

Gehu and the early strains of Squaw corn are most satisfactory for hogging off. Hogging off is a means of finishing pigs with a minimum of labour during the busy harvest season. The corn should be in the dough stage and the pigs weighing over 125 pounds to make the best use of this kind of feed.

WINTER RATIONS FOR BREEDING STOCK

Ground oats	200 lbs.
Ground barley	200 lbs.

Leafy, green, alfalfa hay.

(Lacking alfalfa or skim milk, add five percent. tankage, meat meal, or commercial hog concentrate to the meal mixture.)

Two to three pounds of this mixture should be allowed daily for each hundred pounds of live weight. A sow weighing 300 pounds would require 6 to 9 pounds of feed daily, the amount depending upon the quality of the feed grains and upon the condition of the sow. One hundred pounds of bran should be added to the mixture for sows ten days to two weeks before farrowing. Reduce the feed allowance two to three days before farrowing. Supplying sows with a mineral mixture during the winter months is advisable.

POTASSIUM IODIDE:

Where iodized salt is not being used, the brood sows should be given a small allowance of potassium iodide daily. Such a precaution during the fall and winter will **prevent the occurrence of hairless litters**, and will also assist toward the production of stronger pigs at birth.

A potassium iodide solution for pregnant sows in winter can be made up by dissolving one ounce of potassium iodide in a gallon of water. One teaspoonful of this solution is given in the drink or feed for each sow daily.

EXERCISE FOR BROOD SOWS:

Exercise is essential for pregnant sows. The sleeping quarters and feeding ground, especially in winter, should be so arranged that the sows are compelled to take exercise. Healthier sows and stronger litters will result.

ROUGHAGE FOR BROOD SOWS:

Green, leafy alfalfa or clover hay is relished by brood sows in winter. It is a good plan to keep a small rack filled with such hay, and located in a sheltered spot where the sows have access to it.

SHELTER:

Neither breeding stock nor growing pigs thrive in damp quarters. This is especially true when the weather is cold. The straw shed is an economical and efficient type of shelter. A windbreak should be provided for pigs that are fed in the open during the cold weather.

RATIONS FOR NURSING SOWS

Ground barley	200 lbs.
Ground oats	200 lbs.
Bran, or rolled wheat, or coarsely ground wheat	50 lbs.
Tankage or mixed protein supplement	25 to 35 lbs.
(Skim milk may replace the tankage or supplement.)	

Feed as much as the sows will readily consume three times daily. (Do not full feed nursing sows until a week to ten days after farrowing. Drink, preferably with the chill off, should be supplied generously.)

RATIONS FOR WEANLING PIGS

Ground SIFTED oats	125 lbs.
Ground SIFTED barley	125 lbs.
Middlings, or coarsely ground wheat, or rolled wheat ..	100 lbs.
Tankage or mixed protein supplement	100 lbs.

When an abundance of milk is available for feeding it is unnecessary to use a protein supplement.

CREEP FEED THE LITTER:

Young pigs should be provided with a suitable meal ration just as soon as they begin to show interest in this kind of feed. It is a good plan to place a small trough out of reach of the sow, and supply feed such as recommended for weanling pigs. Creep feeding the litter prevents the usual set-back that occurs at weaning time, and promotes more rapid growth.

PREVENTION OF ANAEMIA IN YOUNG PIGS:

Unless preventive measures are taken, anaemia is almost certain to occur in winter or early spring farrowed pigs. Supplying clean grass sods to the litter daily during the suckling period is a practical means of prevention. Sprinkling the sods with a solution of ferrous sulphate adds to their value for anaemia prevention.

Where sods are not available, an iron compound, such as ferrous sulphate or "reduced iron," given to the young pigs individually is also effective. The preventive treatment should be commenced when the litter is two or three days old. As much ferrous sulphate as will cover a disc one-half inch in diameter is the recommended dosage. It should be spread well in the mouth, preferably between the cheek and the teeth, or better still, given with a teaspoon of cod liver or pilchardene oil. The ferrous sulphate should be given twice weekly until the pigs begin creep-feeding. "Reduced iron," given in an amount equal in volume to two aspirin tablets when the pigs are 3-10 and 20 days old will provide protection. The "reduced iron" and ferrous sulphate are obtainable at most drug stores.

For pigs that are showing definite symptoms of anaemia, dosing with a solution of iron ammonium citrate is recommended. The solution is made up by dissolving one-half ounce of iron ammonium citrate in one pint of warm water, and adding three-quarters of a pound of sugar or syrup. This solution is given at the rate of one-half teaspoonful per pig every three or four days.

POULTRY FEEDING

Poultry production in Manitoba centres largely on farms where ample supplies of grain are grown. This can and should lead to low-cost, efficient production. Grain in some form may comprise 75% to 90% of a well-balanced poultry ration. Frequently, however, a full grain bin means careless or indifferent feeding because no attempt is made to balance the ration properly. One must include all the essential nutrients in order to obtain a profitable rate of growth or egg production. The poultry raiser who must buy all his feed knows this full well, and in addition he aims to sell only high quality products; otherwise he cannot continue long in business. The purpose of this publication is to encourage the efficient use of feed on Manitoba farms where poultry and eggs are being produced. It is the poultry keeper's responsibility to market well-finished birds, and eggs of the best quality, in order to secure maximum returns in relation to feed and other costs.

ESSENTIAL NUTRIENTS

The following six classes of nutrients are essential to life, growth, production and reproduction in all classes of poultry. Nature supplies most of these essentials in the form of pasture, bugs and insects, gravel, grains and seeds, sunshine, etc. Indoor feeding of young or adult poultry, places full responsibility on the attendant to supply these same requirements in some form or another and in adequate but not excessive amounts.

1. **WATER:** Birds can live longer without food than without water. Lack of a constant supply of fresh water hinders the growth of young poultry; it leads to low egg production and early moulting in the laying flock.

2. **PROTEIN:** This is usually the most expensive feed material, but the one most likely to bring profitable results if properly used. Protein from animal sources—milk, liver, fish scraps, meat or meat meal—is more effective in promoting growth and egg production, than protein from most vegetable sources. Grains alone are entirely inadequate in amount and kind of protein. Excess protein has a forcing effect which may be detrimental to poultry of any age.

3. **CARBOHYDRATES:** These are the starchy materials in grains and grain products. Only a starved flock will lack for carbohydrates. They supply fuel and energy, the excess going to form fat in the body or egg.

4. **FATS:** Some fat is present in practically all feed materials. An excess of fat from fish oil or meat and fish products, may cause digestive upset in birds, and lead to such disorders as fatty degeneration and "crazy chick disease."

5. **MINERALS:** Calcium carbonate (from limestone or gravel, clam or oyster shells, bone, etc) in the presence of Vitamin D, forms most of the egg shell. Calcium and phosphorus make up the major

part of bone; but excess phosphorus (from bone materials) may immobilize the manganese in the diet, leading to crooked bones and slipped tendons in the chicks and poults. Salt supplies some essential minerals. Green feed contains small amounts of certain highly important minerals.

6. **VITAMINS:** The naturally speedy growth of young poultry soon reveals any vitamin deficiencies in their rations; hatching of eggs is a critical test of the vitamin content of a breeder diet. Most commonly lacking in Manitoba rations are:

(1) **Vitamin A** (from green feed, yellow corn and fish oils). Vitamin A protects against colds and infections.

(2) **Vitamin D** (in marine fish oils and synthetic products, or formed in body when exposed to ultra-violet rays of sun). Vitamin D aids in laying down of mineral in shell or bone, and in preventing leg weakness and rickets.

(3) **Riboflavin** (in milk, liver, yeast, green feed, synthetic riboflavin, etc.). Riboflavin promotes the growth of chicks and poults, both in the egg and after hatching; hence it is one of the most important factors in hatchability. Riboflavin prevents nutritional or curled-toe paralysis in young chicks.

FEEDS

Wheat usually is one of the best grains for poultry feeding, although a proportion of coarse grains in some form should always be included in the ration, along with wheat. In seasons of rust or frost, when wheat is shrunken, more should be ground and fed in mash and less in the scratch feed. Either hard spring or Durum wheat may be used.

Oats vary considerably in feeding value, due to difference in hull. They can be fed whole as a part of a scratch feed, or in mash in the crushed, rolled, or finely ground form. If light, sift out the hulls; poor quality oats frequently have so much hull as to be of little use for poultry feed.

Barley will work in well as a part of the scratch feed and in mash in crushed, rolled or finely ground form. Ordinarily it is not quite as palatable as wheat or oats; still in seasons when these two grains are of poor quality and the barley is fair or good, more can be fed in the different forms, or even as boiled or soaked barley, with very good results.

Corn is a very desirable grain fed whole, cracked or ground. Ripe corn on the cob may be fed to hens and turkeys. Shelled corn may be used with other grains as scratch feed. Corn chop could be included in any of the dry mash rations listed in this circular. The corn, if not thoroughly dried, should be mixed with the other chop in the mash immediately after grinding.

Millet (proso or hog millet), where grown, may be used to good advantage in growing, laying, and fattening rations. Millet may comprise up to one-third of the whole grain fed, and up to one-third of the chop mixture in dry mashes.

Rye is not as palatable as wheat, oats or barley, but can be fed in limited quantities as a scratch feed or in mashers along with two or more of the other grains. In large quantities it is likely to cause digestive disorders.

Flax is high in protein and fat. A small amount may be fed in the whole or ground form in mashers during the moulting season and fall and winter months. Linseed oil cake meal may also be used.

By-products of grain (such as wheat middlings, shorts, bran, barley meal, oat flour, oat middlings, and oat feed) have a place in poultry feeding, especially where feed must be bought. They may be higher in price than the whole grain, and if used should be fed for a specific purpose, such as bran, shorts or middlings in growing and laying rations, and oat flour, oat middlings, oat feed, or barley meal in fattening rations.

Skimmilk and Buttermilk are **Excellent for all Classes of Poultry** but especially valuable for young chicks, laying hens and fattening birds. Milk supplies the vitamin riboflavin which is indispensable to high hatching quality in eggs. As a desirable protein supplement, milk undoubtedly heads the list.

Meat Meals and Fish Meals are commercial by-products which are useful protein supplements when the supply of milk is inadequate. They also provide a source of mineral.

"Concentrates" and **"Balancers"** are especially prepared supplements put up by feed companies. They should be added to home-grown chopped grains in proportions recommended by the manufacturers.

Fish Oils (cod liver oil, pilchard oil, etc.) are used in chick rations, in winter laying rations and in rations for producing eggs for hatching, as a source of Vitamins A and D when the supply of green pasture and direct sunshine is limited or lacking. Standard fish oils for poultry feeding should contain 1,250 units or more of Vitamin A, and 200 A.O.A.C. units or more of Vitamin D, per gram. If fed in dry mash the oil should be mixed first with a small quantity of ground wheat.

RATIONS FOR GROWING CHICKENS

STARTER RATIONS:

Young chicks require a diet rich in protein and certain vitamins, with a carefully balanced mineral content. Two pounds of chick starter dry mash will feed one chick up to about six weeks of age. After that, in the case of birds to be reared to maturity, a cheaper ration with increasing amounts of whole grain may be used. Birds to be killed as broilers, however, should be kept on a more concentrated diet to promote the rapid growth essential to profit in broiler raising.

While one may mix chick starter at home, the simplest plan is to purchase 200 pounds of commercial chick starter mash for each 100 chicks. Choose a brand that is flaky or mealy, avoiding the less palatable finely ground mixtures that tend to paste inside the chick's mouth. The dry mash should be stored in a cool dry place and fed fresh daily.

Start feeding the chicks as soon as they want to eat. Place dry mash on clean egg-case flats (cup type) or on clean cardboard, at

several points around the brooder, with possibly a little cracked wheat or chick scratch grain sprinkled over the mash. After two or three days, when all the chicks have learned to eat, place the dry mash in self-feeders. The usual method is to keep dry mash continuously before the birds, though some people prefer to lift the feeders for an hour at a time during each half day.

Provide a constant supply of fresh drinking water in clean chick fountains. Place hard insoluble granite grit or fine gravel in pans or hoppers separate from the feed. In addition to the dry mash a little cracked wheat may be fed at three weeks, and a little whole wheat after four weeks.

	Chick Starter No. 1	Turkey Starter
	lbs.	lbs.
Coarsely Ground Wheat	30.0	25.0
Coarsely Ground Oat Groats	18.0	10.0
Medium Ground Barley	15.0	15.0
Finely Ground Oats	10.0	10.0
Wheat Bran	5.0	5.0
Meat Meal (60% Protein)	5.0	10.0
Fish Meal (67% Protein)	5.0	10.0
Milk Powder	3.0	4.0
Alfalfa Leaf Meal	5.0	7.0
Linseed Oil Cake Meal	1.5	1.5
Fine Oyster Shell or Limestone	1.5	1.0
Fine Iodized Salt	.5	.5
Fish Oil (200 D)	.5	1.0
Manganese Sulphate (see below)		
	<u>100.0</u>	<u>100.0</u>

To each ton of chick or turkey starter mash, add 4 ounces of powdered Manganese Sulphate, pre-mixed in the salt. Thoroughly mix the fish oil into part of the wheat chop until no lumps are left. Add each ingredient in a thin even layer over the previous one, starting with materials used in greatest amount and ending with the smaller amounts on top. Shovel from the bottom of the pile, turning the mix three times.

Chick Starter No. 2

Suitable if chicks will have good pasture at 2 or 3 weeks of age.

Coarsely Ground Wheat	40 lbs.	Milk to drink.
Oat Chop (sift out coarse hulls)	25 lbs.	
Barley Chop (sift out coarse hulls)	25 lbs.	Alfalfa or Clover chaff or other green feed, until chicks are on pasture.
Meat Meal (60% Protein)	10 lbs.	
Fine Iodized Salt	½ lb.	Fine Gravel and Oyster Shell
Fish Oil (200 D)	½ lb.	in separate pans or hoppers.

GROWING RATIONS:

After the chicks are five to six weeks old they may be changed gradually to a coarser and cheaper mixture, e.g., ½ starter mash and ½ growing mash during the sixth and seventh week.

Growing Mash (in self-feeders)

Ground Wheat	100 lbs.	
Ground Barley	100 lbs.	Oyster shell and gravel,
Ground Oats	75 lbs.	or limestone grit, in
Meat Meal	25 lbs.	separate pans or hoppers.
Fine Salt	3 lbs.	

Whole Grains (in self-feeders)

(Whole Wheat, Whole Oats, and other available Grains)

To promote the growth of late hatched pullets or of market poultry, give milk to drink as well as water. Milk may be used to replace the meat meal in the growing mash, if a separate hopper of bone meal is provided. Reduce or omit meat meal or milk if pullets are maturing too rapidly. If pasture is dried up or lacking, add 20 pounds of alfalfa meal and 2 pounds of 200 D fish oil to the above growing mash.

PASTURE:

A special effort should be made to provide tender green pasture throughout the growing period. Fall rye sown in the fall, provides early pasture for early hatched chicks. One acre sown in the spring to a mixture of 2 bushels of fall rye and $\frac{1}{2}$ bushel of oats, will carry 300 to 400 chicks through most of the season. Or a thick seeding of oats may be used on the start; then after alfalfa or clover hay is cut, the colony house or shelter may be moved there to give the flock clean ground and fresh green feed. Keep pasture short by grazing or cutting. A few rows of corn may be planted to give shade and shelter.

Pasture lowers the cost of growing poultry. It reduces the amount of mash and grain consumed, and allows one to use a cheap and simple growing ration. Good pasture helps to grow sleek smoothly-feathered vigorous pullets, enabling them to withstand the strain of heavy egg production the following winter.

RATIONS FOR LAYING HENS

Egg production, to be profitable, must continue at a reasonably high level through most of the year. Hens turned loose to forage in the spring and only grain fed, soon lay themselves thin, cease laying, moult, and spend the summer and fall growing new feathers; moreover any eggs they lay are likely to be of "barnyard" quality and low grade. Laying hens require some form of protein supplement in addition to grain and chop. Similarly they need more vitamin and mineral materials than grains contain. Most poultry raisers recognize the importance of diet in winter egg production. Generous summer feeding is equally important, since profit depends upon a steady production of eggs.

A farm supplied with wheat and coarse grains, well-cured alfalfa or clover hay, and plenty of skimmilk, provides practically everything required in the laying diet. Some form of Vitamin D supplement is needed for winter or indoor conditions. Hens aren't likely to drink enough milk in cold weather to supply their protein requirement; this may be met by the use of laying concentrates or balancers, meat meal, fish meal, cooked meat or fish, etc. In any case the flock should have an ample daily feeding of alfalfa or clover leaves, or else limited pasture. Laying hens require a constant supply of oyster shells or limestone grit; also bone meal in a separate hopper when milk is used as the main protein supplement. **Provide fresh clean drinking water at all times, or as soon as the daily amount of milk is consumed.**

RATIONS FOR LAYING AND BREEDING FLOCKS

	Breeder or Winter Laying		Summer Laying Ration		Breeder Rations (Dec.-June)		Winter Laying Rations	
	1. Milk, to drink	2. Milk, to drink	2. Milk, to drink	3. Breeder Concentrate	4. Milk plus Concentrate	5. Laying Concentrate	6. Milk plus Concentrate	
I. DRY MASH MIXTURE (in self-feeder)								
Ground Wheat	100 lbs.	100 lbs.	100 lbs.	Concentrate with chop, per manufacturer's instructions — — —	Reduce amount of concentrate to ½ mfg'r.'s instructions — — ½ % of mash	Concentrate with chop, per manufacturer's instructions — — —	Reduce amount of concentrate to ½ mfg'r.'s instructions — — ½ % of mash	
Ground Barley	100 lbs.	100 lbs.	100 lbs.					
Ground Oats	75 lbs.	75 lbs.	75 lbs.					
Meat Meal (50%)	10 lbs.	10 lbs.	15 lbs.					
Fish Meal	10 lbs.	—	—					
Fine Salt	3 lbs.	3 lbs.	3 lbs.					
II. SUPPLEMENTS (fed daily) (per 100 hens)								
Alfalfa or Clover	Daily	Daily*	Daily*	Daily	Daily	Daily*	Daily*	
Skim-milk to drink	2 gals.	3 gals.	3 gals.	—	2 gals.	—	2 gals.	
Fish Oil (200 D)	1½ cup	2 tblsp.*	2 tblsp.*	2 tblsp.	1¼ cup	2 tblsp.*	1¼ cup*	
III. WHOLE GRAIN (fed daily)								
100 Pullets (A.M.)	4 lbs.	—	—	4 lbs.	4 lbs.	4 lbs.	4 lbs.	
(P.M.)	10 lbs.	10 lbs.	10 lbs.	10 lbs.	10 lbs.	10 lbs.	10 lbs.	
100 Yearlings (P.M.)	10 lbs.	10 lbs.	10 lbs.	10 lbs.	10 lbs.	10 lbs.	10 lbs.	

*Omit in summer if birds have pasture (also omit morning whole grain in summer to encourage dry mash consumption).

IV. MINERALS: A constant supply of oyster shell and gravel, or limestone grit, in separate hoppers. Also—for rations 1, 2, 4, and 6 above—place bone meal in a separate hopper.

V. MOIST MASH (if fed): For 100 hens take 4 pounds of dry mash and moisten to a crumbly state with milk or water, first adding the fish oil to the liquid. Once started, it is advisable to continue feeding moist mash daily, in addition to the dry mash, throughout the laying season. (If moist mash is not fed, mix the fish oil with whole grain and feed in a trough.)

WHOLE GAIN: Various mixtures such as 3 bu. wheat, 2 bu. oats, 1 bu. barley, may be used.

GREEN FEEDS: Well-cured alfalfa or clover leaves or chaff are excellent. Carrots, cabbage, beets or mangels may be fed in moderation (not over 5 lbs. per day for 100 breeding hens).

FALL CARE OF PULLETS

Generally speaking pullets starting to lay in the fall should be placed in winter quarters and fed a laying ration before egg production reaches 10 per cent. Those housed in August or September require a fenced run with good pasture, or plenty of green feed in some form, to offset the change from free range.

Pullets should be housed separately from yearling or older birds. Keep pullets gaining in body weight each month of the fall and until about March. If they lose weight, neck moult or possibly a complete moult will follow, with consequent loss in egg production. To maintain body weight, feed in troughs all the whole grain the birds will eat in the evening, and about half that amount the next morning in dry litter or troughs; keep fresh dry laying mash before them, daily; and if necessary feed moist mash at noon. Excessively high production from pullets in fall and winter may lead to numerous double-yolked and shell-less eggs, feather-picking, prolapse, and cannibalism, as well as loss in weight and moulting. If production reaches 60 per cent. feed more whole oats, putting the oats in a trough before the birds all the time, in addition to the regular feed.

SOAKED ALFALFA FOR WINTER GREEN FEED

For 100 hens take 3 pounds of good quality second-cut alfalfa hay, run through a cutting box to one inch lengths, and soak overnight in a barrel of fresh water. Drain until noon, and feed in troughs.

This is a means of increasing the amount of green feed consumed by laying and breeding flocks while confined indoors. In some cases the feeding of soaked alfalfa serves to prevent or check feather picking and cannibalism.

RATIONS FOR BREEDING STOCK

A ration suitable for egg production, is not necessarily satisfactory for the breeding flock. To obtain high hatchability, the riboflavin content of the feed must be greatly increased. This is provided in milk, or in specially prepared commercial breeder concentrates or balancers. Extra Vitamin D is required over the amount in laying rations. See Ration No. 1, 3 and 4 (page 29) for suggested amounts of milk, fish oil, etc. Note that the daily feeding of clover or alfalfa leaves is recommended in all cases. Any change in feed must be made gradually. **The flock should receive the breeder diet a full six weeks or two months prior to saving the first eggs for hatching.**

FATTENING RATIONS

Fattening of poultry is likely to be disappointing unless the birds are in good flesh to begin with. Flesh is produced during the growing season, and if lost through improper or insufficient feeding it is difficult to regain. This means that market poultry should be well fed all summer. The cockerels might well be enclosed in a large yard to keep them separate from the pullets. Give the cockerels one feed of moistened mash daily in addition to the growing mash and whole grain. Provide plenty of green or succulent feed during the growing season; also plenty of milk or water to drink.

Allow two to three weeks for the final fattening period. Wheat, oats and barley are satisfactory feeds for fattening.

	Ration No. 1	Ration No. 2	Ration No. 3
Ground Wheat	50 lbs.	100 lbs.	50 lbs.
Ground Oats	100 lbs.	100 lbs.	50 lbs.
Ground Barley	50 lbs.	100 lbs.	100 lbs.
Fine Salt	2 lbs.	3 lbs.	2 lbs.

Grind all the grains as finely as possible. Use No. 3 C.W. oats and barley; if lower grade sift out hulls.

For crate-fattening, mix mash with skim-milk or buttermilk to make a batter that will pour nicely. If milk is not available, add 7 pounds meat meal to each 100 pounds of grain and use water to make the batter. Feed lightly at the start, then all the birds will eat twice a day. **Give water to drink after each feeding.** For pen fattening feed wet mash two or three times daily. Boiled potatoes may be added to the wet mash.

The liberal use of skim-milk or buttermilk in fattening rations will tend to produce chickens that can be classed as "milk-fed."

Whether fattening in crates or pens, allow twenty minutes for wet mash feeding, and do not leave any in the troughs from one meal to the next.

TURKEY FEEDING

The feeding of turkeys differs but little from that of chickens and laying hens. Young turkeys may be a little more exacting in their requirements than are chicks, and the growing turkeys and the adults will forage over a greater area than do chickens; otherwise there is little difference. Turkey poults must be taught to eat right on the start—failure to do this is a common cause of loss in brooder turkeys. Any lack in the ration will show more quickly in little turkeys than in chicks. This is especially true in the earlier hatches that are brooded indoors for the first few weeks, reared where there is a lack of green feed and sunshine.

BREEDING TURKEY RATION

Early in February the breeding birds should be given a good laying mash such as described for breeding hens in this bulletin. This involves the generous use of milk, clover or alfalfa leaves and cod liver oil. Care should be taken not to let the breeders become over-fat prior to the breeding season.

TURKEY STARTER

Use commercial turkey starter, or the turkey starter mash listed on page 27, or chick starter No. 2 with doubled amounts of meat meal and fish oil. Use either liquid milk or dried milk as recommended. If the baby turkeys do not eat the dry feed readily, it is advisable on the start to moisten small amounts of the starter mash, using sour milk or eggs for moistening. The eggs should be boiled 20 minutes and run through a meat chopper. These moistened feeds are given several times daily in addition to the dry starter mash which is kept before the birds at all times. Provide plenty of green food in the form of finely cut onion tops, dandelions and green alfalfa. Sprinkle the cut green feed on top of the dry mash.

Provide a supply of clean gravel and oyster shell in open hoppers from the start.

When turkeys are about two months old and on good pasture gradually change to growing mash similar to the one described for chicks. Also give sour milk to drink and hard grains in open hoppers. An extra feed daily of moist mash will stimulate growth. If milk is not available add an extra 5 pounds of meat meal to each 100 pounds of growing mash.

Move feed troughs and drinking dishes daily to clean ground, as a precaution against blackhead, intestinal worms, and other infection. also endeavour to prevent the young turkeys from mingling with the chicken flock.

There is always danger of under-feeding growing turkeys because of their habit of roaming. Unless they get an extra feed at night when they return to the buildings they are likely to develop a framework with but very little fleshing. This is likely to make later fattening work very disappointing.

In fattening, restrict the range. As turkeys fatten, they roam less. In some cases they may be confined to a yard or building. They should never be put into fattening crates.

Continue hopper feeding both hard grain and dry mash and give one feed a day of soft crumbly mash, adding boiled potatoes, turnips or carrots. Give milk to drink, if available. Whole grains, boiled or soaked, adding the dry mash and boiled vegetables, will also make a very good fattening mash. Wheat, oats and barley, in about equal parts, are satisfactory as a fattening ration. Oats give the desired white color to the carcass; for that reason, it is recommended that a larger proportion of oats be fed than of barley. These feeds should be ground. Whole grains may also be used to lend variety. Corn is a good fattening feed, and on farms where grown its use is desirable, but it has a tendency, if fed in abundance, to produce yellowness of fat. For this reason it should be fed only in combination with other grains.

RATIONS FOR DUCKS AND GEESE

Moist mash feeding should be followed almost entirely in feeding and fattening ducklings and goslings. Any of the farm grains, fed singly or in combination, ground fine, adding milk or water and finely cut green feed, will make a good growing ration. Keep clean sand or gravel available to the birds at all times. Feed five times daily on the start, then three or four times a day. To force growth and market early, put 10 pounds of meat meal in every hundred pounds of mash. To fatten, restrict range or confine in yards or pens, cut down on green feed, give wet mash twice a day and give plenty of milk or water to drink.